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U. S. DEPT. OF AGRICULTURE

NEVADA COOPERATIVE SNOW SURVEYS

Part II. Humboldt River Basin,
Eastern and Southern Nevada,
National Wildlife Refuges

Final Seasonal Snow Survey and Kindred Data,
April 1, 1942

Issued in cooperation with the Nevada Agricultural Experiment Station, United States Division of Irrigation of the Soil Conservation Service, Forest Service, Bureau of Reclamation, Weather Bureau, Geological Survey, Fish and Wildlife Service, Humboldt River Water Users, Nevada State Engineer, and Elko-Lamoille Power Company.

Nevada Agricultural Experiment Station

Reno, Nevada

HUMBOLDT RIVER BASIN

Progress

The snow survey system in Nevada is now well expanded and needs only refinement. Courses have been laid out in the Reese River and Baker Creek areas and surveys of the snow cover there have been made. With the cooperation of the Experiment Station a snow cabin has been constructed by the Forest Service on the upper Reese River and further readjustment and construction of cabins are planned in the Jarbidge area to obtain snow-survey data for the upper Marys River without exhaustion and exposure to avalanche peril, such as befell the survey party in 1941.

Last summer the Oregon and Nevada Cooperative Snow Surveys joined in an inspection trip of watersheds and snow-survey courses across northern Nevada from the Sheldon Game Refuge to Jarbidge where the Owyhee, Bruneau, and Humboldt river systems have common sources. As a result some extension of snow-survey stations was planned and the possibility of easier approach by airplane was discussed. Since Quinn River shares the Santa Rosa Mountains with the Little Humboldt, which now has a well organized forecast system, the annual forecast for the latter will be applied hereafter to both.

The lack of stream gaging on the Quinn, Reese, and Baker Rivers makes it impossible to check the accuracy of the forecasts and provide more than general impressions of water supply. However, a year-round gaging station has been established by the U. S. Geological Survey, Water Resources Branch on the Little Humboldt River below its two main forks, and above most diversions. Staff gage readings and discharge measurements are now made on Mary Creek at Carlin with measurements of Maggie and Susie Creeks and the main Humboldt at Moline Canyon.

Charts of streamflow and rating tables are being steadily developed and a new set of normals has been made for the flow of the Humboldt River at Palisade to include the flow for the past decade. New normals for snow cover will likewise be made in adjustment to the lowering of the normal of streamflow. More normals for the many courses will now be attempted. Still awaiting attention is the installation of a recorder on the Marys River below main tributaries but above diversions.

The making of snow surveys March 1 and April 1 to determine the snow cover resources at the beginning of melting and summer streamflow has been fully justified and will be continued. Even later surveys are desirable as will be seen by this report.

Because of the flood that nearly escaped detection from lack of daily temperature records, recording thermometers should be placed at accessible points in the main watersheds near the snow cover itself.

Two Unusual Years: 1940-41 and 1941-42

The past and present years have brought surprises as great as Pearl Harbor but have revealed the power of moderate precipitation or temperature when prolonged or combined. The experience will ultimately provide increased foresight and accuracy. The present forecast, long delayed, is therefore an analysis with suggestions rather than a close estimate of flow. The tables will provide desirable data for comparison and a foundation for conclusions.

During the preceding seasons of 1938-39 and 1939-40, the divergence between forecast and runoff was only 4.6 and 4.3 percent of normal respectively with a snow cover March 1 of 69.4 and 56.0 percent. The winter and summer flow at Palisade both seasons was also below normal and the ground-water level as shown by wells in Lamoille and Elko Valleys was relatively low.

The snow cover of 1940-41 on March 1 and the attending winter runoff were similarly low, being 71.4 and 64.2 percent of their respective normals. The ground-water level was much lower than on any previous year of measurement except 1940 in Elko Valley.

During March, the initial month of the runoff season and its index of trend, the precipitation was below normal and the temperature slightly above (departure +1.4°F.). The runoff at Palisade was 50.9 percent of its monthly normal or 20.5 percent of normal below the snow cover of March 1 and 7.7 percent below the snow cover of April 1. Therefore, a revised forecast was made of a probable March-July runoff of 60 percent or 150,000 acre feet.

The temperature during the season was relatively low but the precipitation increased to double normal throughout April-June, when most effective on the snow, and produced a total runoff for March-July of 271,500 acre feet, leaving an excess of 121,500 acre feet or 48.6 percent of normal above the 150,000 acre feet forecasted.

This tendency was realized by May 1 but even then only 40,000 acre feet was added to the forecast, leaving it still 32.6 percent below the actual. This was inevitable, for there was no means of knowing that the excessive rains would continue.

This result was due to water accumulating on the high watersheds as well as being detoured around the meadows because of surplus rain, which decreased the necessity for heavy irrigation. The farmer is shown by the heavy flow in Lamoille and Martin Creeks at their canyon outlets above diversions.

In the comparison, the snow cover of April 1 has been chosen as a more substantial basis than the adjusted forecast.

Comparison of Snow Cover and Runoff, 1941
(Percent of normal)

Humboldt River at Palisade		Lamoille Creek		Martin Creek in Little Humboldt Basin	
Snow Cover	Runoff	Snow Cover	Runoff	Snow Cover	Runoff
Apr. 1	Mar-July	Apr. 1	Mar-July	Apr. 1	Mar-July
58.6	108.6	72.1	121.0	87.6	129.8
Excess	50.0		48.9		42.2

The excess of the main upper Humboldt affected by irrigation is scarcely more than that of the mountain streams.

The Utah rivers likewise exceeded their forecasts. The Sierra Nevada streams, however, conformed to their snow cover for they were outside of the belt of excessive rain.

The rains continued into the winter building up an unusual streamflow and ground storage destined to affect materially the runoff of the succeeding present season.

This season of 1941-42 is the extension of the factors prevailing last year accentuated by the accumulation of low-level snow from cold, and its sudden melting by high temperature.

Flood years are rare and no stream measurements were ever made of the destructive flood on the Humboldt in 1910 which is comparable to the present and will be described at the end of this report.

Altho the precipitation of the summer and autumn was quantitatively small, its excess above normal was 92.4 percent, and 43.0 percent for the first half of the winter. The resulting ground water, shown by well measurements in Elko and Lamoille valleys, continued to build up until it rose 3.7 feet from minimum to maximum within the short period of a year. The winter runoff at Palisade kept pace and exceeded normal for the first time since 1923-24, attaining 140.2 percent of normal. That this was not true also of Martin Creek is due possibly to the smallness of the stream and its susceptibility to freezing.

On March 1 the snow cover was 89.9 percent of normal and on April 1, 83.9 percent while the low-level snow retained at the latter date a percentage of 77.7. March was cold (temp. departure -2.7°F . at Elko and -3.8°F . at Lamoille) and the precipitation was 53.6 percent deficient, yet the runoff for the month was 126.5 percent of its normal, indicating evidently ground water effects. Altho the low-level snow cover was within 10 percent of the high-level of March 1 and snow in mid-March was heavy in the foothill meadows of the tributaries of the Humboldt, the low snow at snow-survey stations was but little in excess of that of 1941 and did not occur at all in the lower Humboldt at Austin and Paradise Valley which have been indexes to previous floods.

But the sudden rise in temperature in early April to 12.0°F above normal (as measured at Lamoille) and its continuance at $+6.0^{\circ}\text{F}$ during the following two weeks caused a runoff at Palisade for the month of 152,000 acre feet and flooded lowlands along both the upper and lower Humboldt. The temperature departure at Elko during the first three weeks, however, was only $+3.0^{\circ}\text{F}$ and fell to -1.5°F for the month. The precipitation was 132.0 percent of normal or one-third in excess.

The excessive runoff noted at Palisade prevailed also in the Little Humboldt Basin as in North Fork and Secret Creek and on the lower portions of Marys River, Lamoille, and South Fork. High water was reported along the foothills on both slopes of the Continental Divide.

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In Martin Creek of the Little Humboldt Basin the runoff as measured April 1-12 was 280 percent of normal. The precipitation for the entire month in this basin was 162.8 percent. In contrast, but because of its high elevation, the upper Reese River basin adjoining it on the south had no high water at all.

The runoff at Palisade May 1-16 is already 51,800 acre feet or 81.5 percent of the normal for the entire month. The precipitation at Lamoille is 72.2 percent and the temperature -5.5°F.

The snow cover in Lamoille Canyon at 8,500 and 9,000 ft. elevation is slightly more than on March 1 and at the latter elevation is 109.8 percent of the March 1 normal. However, the snow at 7,400 ft. elevation and below is gone and the higher areas are small.

-Forecast-

Upper Humboldt Basin

The following factors enter into the final forecast:

1. Snow cover March 1.....89.9 percent, at Palisade 225,000 A.F.
2. Precipitation to date (May 20) 86.9 percent
(defic. 13.1)
3. Temperature at Lamoille Mar. -3.8, Apr. +6.3,
May -5.5°F.
4. Gain in flow from ground storage 5 mos..... 25,000 " "
(5,000 A.F. monthly)
5. Accumulation though excess flow over assimilation
(on basis of 1913-14 at Palisade, due however, to
winter precipitation 132.0 percent, summer precip.
approx. 130 percent, and temp in March +2.0°F)
15 percent of March-July normal..... 100,000 " "
No other evidence is available.

Total 350,000 A.F.

Of the accumulation in 1913-14, 50,000 acre feet was recorded at Palisade during March, when the rain was light (22.1 percent) and the temperature was high (+2.0°F). The balance (50,000 A.F.) occurred during April-July while the mean temperature was below normal but the precipitation was high (159.1 percent). Therefore, only the 50,000 of March can be considered a positive index of relative flow the present year. Unlike 1940-41 the excess is coming wholly from the floor of the basin and the flow should gradually decline to approximately the percentage of the snow cover. The fall in temperature will tend to postpone the flow.

The following table will present the progress of runoff at Palisade to date:

Monthly Runoff
Palisade
-1942-

Snow Cover

Upper Humboldt March 1	April 1
N. Feeders 87.2%	75.8%
S. Feeders 92.5"	91.9"
Av. <u>89.9%</u>	<u>83.9%</u>

Loss in low-level snow 1.6 in., practically the same as in 1941.

Runoff

N. Feeders 81.9%
S. Feeders 73.4"
Av. <u>77.7%</u>

The runoff is compared with the March 1 snow cover of 90 percent (89.9 percent) of normal.

MARCH

Accum. Surplus

90% of 40,940 A.F. = 36,850 A.F.
Temp. dep. -2.7°F (at Lamoille -3.8°F)
(Mar. 1941 +1.4°F)
Precip. -0.73 in. = 53.6%

14,930 A.F.

APRIL

Accum. Surplus

90% of 56,380 = 50,742
Temp. dep. -1.5°F (at Lamoille +6.3°F)
Precip. +0.47 = 135.1%

116,190 (101,260 + 14,930)

MAY

Accum. Surplus

90% of 63,540 = 57,186
May 1-9, 32,356 A.F.
Estimated for May 70,500 A.F. (min.)

129,490 (116,190 + 13,300)

JUNE

90% of 69,180 = 62,262

JULY

90% of 25,580 = 23,022

Total probable flow (March-July)

90 percent snow.....	225,000 A.F.
Accum. Surplus.....	129,490 A.F.
Total	<u>354,500 A.F.</u> = 140 per-
	cent

The runoff of the tributaries of the upper Humboldt will correspond to the snow cover at their upper elevation and to the accumulated percentage (50 percent additional) at their lower, where flood occurred. Such are Lamoille Creek, South Fork, Starr Creek, and Marys River. Gaging stations for the first two streams are available for comparison.

Lower Humboldt Basin

The Reese River because of its high elevation experienced no April high water but has a potential runoff somewhat greater than last season. No normals are available.

The Little Humboldt Basin, being lower than Reese River Basin, was affected by flood. Martin Creek in early April flowed 300 percent of normal as like the upper Humboldt at Palisade. Its seasonal flow will probably show the same relative excess as the latter.

The flow of the main Humboldt should increase under conditions of high water in its percentage of normal far above that at Palisade because of the preponderant excess of water beyond possible use except for storage. For example in 1913-14 when the flow for April-July at Palisade was 147.8 percent the corresponding flow at Golconda was 75.5 percent of normal greater and at Oreana 156.1 percent in excess. From March 1 to May 22 of the present year the storage at Rye Patch Dam has increased 95,506 acre feet. The flood peak at Palisade (April 8) was 3,875 sec. ft., the flood peak at Callahan above the dam was 2,100 sec. ft. or slightly more than half. A normal is not available. On the basis of the flow at Palisade of 255,569 acre feet from which the 95,506 acre feet increase at Rye Patch was derived, and the forecast for March-July runoff at Palisade of 354,500 acre feet, the total increase at Rye Patch should not exceed 132,500 acre feet and should probably be considerably less since the stream is now falling and diversions for irrigation should increase. This would be 15,800 acre feet in excess of the capacity of the reservoir, which is now being ^{drawn}down/as a precaution against spilling in sufficient quantity to endanger diversion dams below.

The storage in the reservoir on March 1st being about 62,300 acre feet the addition of the estimated maximum increase of 132,500 acre feet would make a total of 194,800 which is 15,800 above the spillway capacity of 179,000 acre feet.

FORECAST SUMMARY

	Normal Runoff March-July Acre feet	Probable Flow		Possible Minimum	
		Acre feet	Percent of normal	Acre feet	Percent of normal
Humboldt River at Palisade	250,000	350,000	140	300,000	120
Lamoille Creek at Power House	22,800	20,500	90		
South Fork at Boltons	35,000	31,500	90		
Martin Creek near Paradise	14,500	20,000	140	17,200	120
Quinn River			140		120

The lower channels of Lamoille and South Fork will flow approximately 140 percent. No normals are available.

Note:- No maximum is forecasted. In all cases the runoff could readily exceed normal by a considerable amount. The probable flow forecast is based upon the assumption that the precipitation at the U.S. Weather Bureau Stations in the Basin for the March-July period will be normal.

NORMAL RUNOFF OF MAIN HUMBOLDT AT PALISADE

Based on 24 yr. record 1903-04 to 1926-27
Corr. March 1930 by H. P. Boardman

(Acre feet)

<u>Winter (Nov.-Feb.)</u>		<u>Spring-Summer (March-July)</u>		<u>Late Summer-Autumn (Aug.-Oct.)</u>	
Nov.	6,020	March	40,940	Aug.	4,720
Dec.	6,780	April	56,380	Sept.	2,660
Jan.	8,310	May	63,540	Oct.	4,450
Feb.	15,810	June	69,180		
		July	25,580		
<hr/> Total		<hr/> Total		<hr/> Total	
36,920		255,620		11,830	

Total annual runoff.....304,370

Note:- For next season at least provisional normals will be computed for many more snow courses and for most streams. A new set of normals for the runoff of the Humboldt at Palisade has already been prepared. See end of this report.

DETAILED DATA

Runoff 1940 and 1941

(Acre feet)

	<u>1940</u>	<u>1941</u>
Marys River in Cabin Field (April-July).....	20,781	25,120
North Fork at U. S. Highway 40 (April-July).....	5,610	19,130
Maggie Creek at U.S. 40 (April-July).....	5,412	13,255
Susie Creek at U.S. 40 (April-July).....	1,138	2,770
Marys Creek at Carlin.....		1,620 Inc.
Starr Creek in Lower Starr Valley (April-July.....	10,472	17,100
Secret Creek above 71 Ranch (April-July.....	5,527	13,410
Lamoille Creek at Power House (April-July).....	24,930	27,590
Lamoille Creek at McIntyre's (April-July).....	20,510	36,610
Rabbit Creek in Seitz Canyon (May-July).....	5,556	
South Fork at Bolton Ranch (April-July).....	40,400	51,970
South Fork at Bullion (March-July.....	67,310	95,870
Humboldt River in Moline Canyon (April-July).....	102,090	211,875
Humboldt at Palisade (March-July).....	130,490	271,500
Humboldt at Callahan Station (March-July).....		90,620
Rye Patch Reservoir-Storage July 31.....		34,510
Martin Creek (April-July).....	16,516	19,564

REVIEW OF THE 1940 FORECASTS

The following table gives the final results as compiled from data furnished by the U. S. Geological Survey and obtained by the Hydrographer for the Humboldt River employed by the State Engineer's office:

	Normal Flow acre feet	Forecasted	Actual Flow acre feet	Difference in Percent of Normal
Humboldt River at Palisade (March-July period)	250,000	140,000	129,370	+4.2
Lamoille Creek at Power House (April-July period)	22,800	25,000	24,930	+0.3
South Fork, Humboldt River at Bolton Ranch (April- July period)	35,000	38,000	40,400	-6.9
Martin Creek, Little Humboldt Basin, at U.S. Gaging Station (March-July Period)	14,300	15,000	16,516	-10.6

Note: The forecast for the South Fork is the first one published and is based upon only three years of record. Extensive studies must be made on the relationship of snow cover to runoff for the Martin Creek drainage, since a change in some of the courses has completely altered the old dependable system that was used in the past. The above forecast for Martin Creek is the first one made based upon new relationships.

The Forecasts for 1940, considered as a whole, were excellent. The goal in forecasting is to be able to come within ten percent of the actual measured flow. This was attained in all but one case, that of Martin Creek, where the forecast was -10.6 percent of normal below the actual. The station that is given the most study and is considered the main one in the Basin is the Humboldt at Palisade for which the forecast was +4.2 percent off.

REVIEW OF THE 1941 FORECASTS

The following table gives the final results as compiled from data furnished by the U. S. Geological Survey and obtained by the Hydrographer for the Humboldt River employed by the State Engineer's office:

	Normal Flow acre feet	Forecasted Flow acre feet	Actual Flow acre feet	Difference in Percent of normal
Humboldt River at Palisade (March-July period)	250,000	190,000	271,500	+32.6
Lamoille Creek at Power House (April-July period)	22,800	21,000	27,590	+29.0
South Fork, Humboldt River at Bolton Ranch (April- July period)	35,000	33,000	51,970	+54.5
Martin Creek, Little Humboldt Basin, at U.S. Gaging Station (March-July period)	14,300	19,000	19,564	+3.8

The original forecast of 150,000 acre feet at Palisade was revised to 190,000 on May 1 but the excessive runoff of 271,500 acre feet was caused by the continuance of the excessive rains which could not be foreseen.

Lamoille and South Fork and Martin Creek were in the same rain belt. If Martin Creek had not been given an excessive forecast, it too would have greatly exceeded estimates. See discussion of "Two unusual years, 1941 and 1942."

THE HISTORY OF THE

REIGN OF KING CHARLES THE FIRST

IN WHICH ARE CONTAINED THE

REMARKABLE PASSES OF HIS LIFE

AND THE CAUSES OF HIS DEATH

BY SAMUEL JOHNSON

IN TWO VOLUMES

LONDON: Printed by J. DODD, in Pall-mall, 1742.

THE HISTORY OF THE

REIGN OF KING CHARLES THE FIRST

WINTER RUNOFF 1940-1941 and 1941-1942
(acre feet)

Humboldt River at Palisade

	<u>1940-41</u>	<u>1941-42</u>
Nov.	1,570	11,020
Dec.	2,200	16,459
Jan.	3,810	16,550
Feb.	13,240	20,269
Total	20,820	64,298
March	20,860	51,777

Martin Creek at U.S. Gaging

<u>Point</u>	
<u>1940-41</u>	<u>1941-42</u>
510	400
550	500
555	600
2,650	800
4,265	2,300
4,500	2,600

Temperature at Elko

°F

Temperature Departure			Mean	Temperature above Freezing (32°F)	
	1940-41	1941-42		1940-41	1941-42
November.....	-2.6	0.0	7.7	8.7	10.2
December.....	+4.0	+ 4.7	6.1	4.6	5.8
January.....	+3.6	- 0.8	3.4	1.6	2.9
February.....	+4.0	- 5.5	5.8	1.6	5.3
March.....	+1.4	- 2.7	11.3	7.1	10.1

WELL MEASUREMENTS

Lamoille Valley

(Average of 5 wells on March 1)

1935.....	5.03	ft. below sur- face of ground
1936.....	3.72	"
1937.....	3.57	"
1938.....	4.50	"
1939.....	3.92	"
1940.....	4.50	"
1941.....	5.70	"
(April 1, 1941 average 4.02 ft.)		
1942.....	3.80	"

Main Humboldt, Elko Co., Average of 7 wells April 1

1938.....	12.59	ft. from sur- face of ground to water level
1939.....	11.53	"
1940.....	13.24	"
1941.....	13.19	"
1942 (Mar. 21st).....	9.19	"

APRIL 1 SNOW SURVEY DATA

1. UPPER HUMBOLDT BASIN (Cont.)

Elevation feet	Date	Snow depth: inches	Density: percent	Water content: inches	Normal water content: March 1	Percentage March 1 normal	Seasonal precip. and percentage of normal: at U.S.W.B. stations: March
Southern Feeders							
<u>Trout-Starr-Secret Creeks</u>							
Trout Creek	8,500						
Trout Creek	6,900						
Dorsey Basin	8,100	50.7	35.5	18.0	13.0	138.5	
Dry Creek	6,500	22.0	38.4	8.4			
Ryan Ranch	5,775	2.1	41.8	0.9			
Lamoille-Rabbit							
<u>Creeks</u>							
Lamoille Canyon	9,000	73.5	39.3	28.9	29.5	98.0	Elko-Lamoille
Lamoille Canyon	9,000†	67.4	41.9	28.2			(6,290-5,077 ft.)
Lamoille Canyon	8,500	51.8	37.9	19.6			1.40 in.(nor. 1.90 in.):
Lamoille Canyon	8,100	43.0	34.4	14.8			73.7
Lamoille Canyon	7,600	38.2	35.8	13.7	12.7	105.5	
Lamoille Canyon	7,400	38.2	34.3	13.1			

† Cross course

1875

1876

1877

1878

1879

1880

1881

1882

1883

1884

1885

APRIL 1 SNOW SURVEY DATA
1. UPPER HUMBOLDT BASIN (continued)

Elevation feet	Date	Snow depth inches	Density percent	Water content inches	Normal water content March 1	Percentage of normal March 1	Seasonal precip. and percentage of normal at U.S.W.B. stations March
Southern Feeders (Cont.)							
South Fork-							
Ruby Lake							
Corral Canyon	Apr. 1	56.7	33.3	18.9			Hylton-Ruby Lake
Green Mountain	Apr. 2	41.8	37.8	15.8			(7,081-6,200 ft.)
Harrison Pass							0.79 in. (norm.)
No. 2							Hylton 1.83 in.)
Harrison Pass	Mar. 31	22.5	26.5	6.0	7.9	73.4	
No. 1	Mar. 31	20.1	27.8	5.6			43.2
Hager Canyon	Apr. 7	51.5	45.7	23.5			
Cave Creek	Apr. 7	36.3	45.6	16.6			
AVERAGE OF SOUTHERN FEEDERS						91.9*	55.8*
AVERAGE OF UPPER HUMBOLDT						83.9	

*The average for the Southern Feeders is computed by weighting the three groups of stations representing South Fork, Lamoille Creek, and Starr Creek on the basis of 2, 1, and 1/2 representing their relative contributions to the flow of the main Humboldt.

APRIL 1 SNOW SURVEY DATA

11. LOWER HUMBOLDT BASIN

Temperature departure March Winnemucca (4,287 ft.) -1.7°F (Mean 38.3°F.)

Mean temperature above freezing 10.0°F (Normal 10.4°F)

Elevation feet	Date	Snow depth inches	Density percent	Water content inches	Normal water content Mar. 1	Percentage of Mar. 1 normal	Seasonal precip. and percentage of normal at U.S.W.B. stations March
Rock Creek-Little Humboldt							
Midas 7,000	Apr. 1	5.3	14.3	0.8			
Little Humboldt Basin							
Lamance Creek 7,000							
Granite Peak 8,600	Apr. 1	40.4	36.6	15.0	13.7	109.5	Paradise Valley-Orovada (4,650-4,300 ft.)
Martin Creek R.S. 7,000	Mar. 31	23.7	54.4	8.1	8.5	95.3	
Upper Buckskin Mt. 8,200	Apr. 2	31.5	36.3	11.5	12.5	74.4	0.30 in. (nor. 0.89 in.)
Lower Buckskin Mt. 6,800	Apr. 2	22.3	31.4	7.0			33.7
AVERAGE LITTLE HUMBOLDT BASIN						93.1	33.7

Reese River Basin

Temperature departure March, Austin (6,594 ft.) -4.7°F (Mean 31.5°F)

Mean temperature above freezing 6.0°F (Normal 7.7°F)

Big Creek							Austin (6,594 ft.)
Upper Big Creek 8,000	Mar. 31	31.6	27.8	8.8			1.74 in. (nor. 1.52 in.)
Cabin Course	Mar. 31	21.1	23.7	5.0			114.5
Big Creek Camp Ground	Mar. 31	4.3	37.6	1.6			
Reese River							
Upper Corral 8,500	Apr. 1	11.5	34.8				
Lower Corral 7,500	Apr. 1	0	0	4.0			

CHANGE IN SNOW COVER AT ALL STATIONS DURING MARCH

(Inches water)

I. UPPER FUMBOLDT BASIN

Temperature Departure Elko (5,077 ft.) -2.7°F (Mean 33.0°F); /Temperature above freezing 7.1°F)
(normal 10.1°F.)

Northern Feeders

	Marys River	Marys River-North Fork	Precipitation at Jarbidge-
	Fox Creek	Big Bend Gold Creek R.S.	Mala Vista
Bear Creek	(8,100 ft.)	(8,000 ft.)	(8,100-5,585 ft.)
			Normal in.

March 1	18.3	9.8	17.7	10.2	8.1
April 1	22.9	8.5		10.4	7.7
Gain or loss	+4.6	-1.3		+0.2	-0.4
					0.58

North Fork

Jack Creek	Jack Creek	Rodeo Flat	Fry Canyon	Tromewan Ranch	Precipitation at Owyhee-
(7,800 ft.)	(7,000 ft.)	(7,000 ft.)	(6,800 ft.)	(5,600 ft.)	North Fork-Tuscarora
					(6,500-5,400 ft.)
					Normal 1.12 in.

March 1	11.5	6.7	11.4	10.5	4.1
April 1	11.0	4.3	9.6	9.0	0.5
Gain or Loss	-0.5	-2.4	-1.8	-1.5	-0.6
					0.46

Susie-Maggie Creeks

Taylor Canyon
(5,200 ft.)

March 1	8.5
April 1	6.4
Gain or loss	-2.1

AVERAGE NORTHERN FEEDERS Gain or loss in snow cover -0.9 in.; precip. 0.52 in.; temp. dep. -2.7°F (Mean above freezing 7.1°F)

1871

1872

1873

1874

1875

1876

1877

1878

1879

1880

1881

1882

1883

1884

CHANGE IN SNOW COVER AT ALL STATIONS DURING MARCH

(Inches water)

1. UPPER KUMBOLDT BASIN (Cont.)

Southern Feeders

Trout-Starr-Secret Creeks

	Trout Creek (8,500 ft.)	Trout Creek (8,900 ft.)	Dorsey Basin (8,100 ft.)	Dry Creek (6,500 ft.)	Ryan Ranch (5,775 ft.)	Precip. at Wells-Clover Valley-Arthur (6,500- 5,633 ft.) Normal 1.50 in.
March 1	17.5	9.0	14.0	7.6	4.3	1.06
April 1			18.0	8.4	0.9	(Clover Valley missing)
Gain or loss			<u>+4.0</u>	<u>+0.8</u>	<u>- 3.4</u>	

Lamoillo-Rabbit Creeks

	Lamoillo (9,000 ft.)	Lamoillo (9,000 ft.)	Lamoillo (8,500 ft.)	Lamoillo (8,100 ft.)	Lamoillo (7,800 ft.)	Precip. at Elk-Lamoillo (6,290-7,077 ft.) Normal 1.90 in.
March 1	23.8	23.7	18.5	13.3	12.7	1.40
April 1	28.9	28.2	19.6	14.8	13.7	
Gain or loss	<u>+ 5.1</u>	<u>+ 4.5</u>	<u>+1.1</u>	<u>+1.5</u>	<u>+0.7</u>	

South Fork-Ruby Lake

	Corral Canyon (8,500 ft.)	Green Mt. (8,000 ft.)#2	Harrison Pass #1 (6,600 ft.)	Harrison Canyon (8,500 ft.)	Cave Creek (7,000 ft.)	Precip. at Hylton-Ruby Lake (7,081-6,200 ft.) Normal 1.83 in.
March 1	15.8	14.1	6.5	21.0	16.2	
April 1	18.9	15.8	5.6	23.5	16.6	
Gain or loss	<u>+ 3.1</u>	<u>+ 1.7</u>	<u>-0.9</u>	<u>+ 2.5</u>	<u>+ 0.4</u>	0.79

AVERAGE SOUTHERN FEEDERS Gain or loss in snow cover +1.4 in.; Precip. 1.08 in.; Temp. departure -2.7°F (Mean above freezing 7.1°F)

Runoff from Upper Basin at Palisade during March 51,780 A.F. (Normal 40,940 A.F.).

CHANGE IN SNOW COVER AT ALL STATIONS DURING MARCH

(Inches water)

II. LOWER HUMBOLDT BASIN

Temperature Departure Winnemucca (4,287 ft.) -1.7°F (Mean 38.3°F)

Mean temperature above freezing 10.0°F (Normal 10.4°F)

Rock Creek-Little Humboldt

Midas
(7,000 ft.)
9.2
0.8
-8.4

March 1
April 1
Gain or Loss

Little Humboldt Basin

March 1
April 1
Gain or loss

Lamance Creek Granite Peak Martin Creek Upper Buckskin Lower Buckskin Precip. at Paradise-Orovada
(7,000 ft.) (8,600 ft.) R.S. (7,000 ft.) (8,200 ft.) (6,800 ft.) (4,650-4,300 ft.)
Normal 0.89 in.

10.4
13.7
15.0
+1.3
8.3
8.1
-0.2
11.2
11.5
+0.3
7.6
7.0
-0.6
0.30

AVERAGE LITTLE HUMBOLDT BASIN Gain or loss in snow cover +0.8 in.; precip. 0.30 in.; temp. dep. -1.7°F (Mean above freezing 10.0°F)

Martin Creek 2,600 A.F. (Normal 2,300 A.F.)

Reese River Basin

March 1
April 1
Gain or loss

Temperature departure Austin (6,594 ft.) -4.7°F (Mean 31.5°F)
Mean temperature above freezing 6.0°F (Normal 7.7°F)

Upper Big Creek Big Creek Camp Ground Reese River Upper Corral Reese River Lower Corral (7,500 ft.)
(8,000 ft.) (8,500 ft.)

6.6
8.8
+2.2
4.9
5.0
+0.1
4.7
1.6
-3.1
5.0
4.0
-1.0
3.0
0.0
-3.0
1.74

Precip. at Austin
(6,594 ft.)
Normal 1.52 in.
1.74

AVERAGE REESE RIVER BASIN. Gain or loss in snow cover -4.8⁺ in.; precip. 1.74 in.;
temp. dep. -4.7°F (Mean above freezing 6.0°F)
No runoff records available.

Main Humboldt River

Precipitation stations only.

Precip. at Battle Mt.
Winnemucca- Rye Patch
Dam-Lovelock (4,513-
3,977 ft.). Normal
0.65 in.

0.43

Runoff Palisade 51,780 A. F. (Normal 40,940 A.F.)

Runoff Callahan Gaging Station near Inlay 25,236 A.F.

(Prov. normal)

Storage in Rye Patch Reservoir 19,591 A.F.

600
500
400
300
200
100
0

1000
900
800
700
600
500
400
300
200
100
0

1000
900
800
700
600
500
400
300
200
100
0

1000
900
800
700
600
500
400
300
200
100
0

1000
900
800
700
600
500
400
300
200
100
0

PAST RECORD (1935-1942) OF CHANGE OF FLOW COVER AT KEY STATIONS DURING MARCH
(Inches water)

Northern Feeders

Southern Feeders

Precipitation
(U.S.W.B.)

	Fox Creek (6,900)	Big Bend (6,800)	Owyhee-North Fork (5,400-5,500 ft.)	Lamoille (7,400 ft.)	Lamoille (7,600 ft.)	Lamoille (8,100 ft.)	Lamoille (9,000 ft.)
1935							
March 1	7.4	9.4		7.6	7.5	8.6	20.4
April 1	6.9	8.8		-	8.5	11.4	-
Gain or loss	-0.5	-0.6	-0.16	-	+1.0	+2.8	-
1936							
March 1	13.6	16.4		7.1	14.1	17.4	36.5
April 1	15.9	19.2		14.3	15.9	17.2	33.9
Gain or loss	+2.3	+2.8	-0.45	+7.2	+1.8	-0.2	-2.6
1937							
March 1	9.1	9.4		10.5	10.5	12.9	20.3
April 1	10.9	10.5		-	12.9	16.0	25.4
Gain or loss	+1.8	+1.1	1.88	-	+2.4	+3.1	+5.1
1938							
March 1	7.2	8.2		8.9	9.2	10.7	19.0
April 1	10.6	11.4		15.1	15.3	17.0	29.1
Gain or loss	+3.4	+3.2	2.38	+6.2	+6.1	+6.3	+10.1
1939							
March 1	8.7	7.2		8.6	9.4	12.6	23.4
April 1	4.5	3.4		2.2	4.5	9.3	21.5
Gain or loss	-4.2	-3.8	-0.41	-6.4	-4.9	-5.3	-1.9
1940							
March 1	5.7	6.4		7.4	9.1	11.8	20.4
April 1	3.5	3.8		7.3	9.6	14.3	29.5
Gain or loss	-2.2	-2.6	-0.06	-0.1	+0.5	+2.5	+9.1

Precipitation (U.S.W.B.) Lamoille (6,100 ft) March (Normal)	Mean Temperature Elko (5,077 ft.) Departure (Normal 37.3°F)	Mean temp. above freezing (Normal 10.1°F)	Snow Cover April 1 (Percentage of March 1 Normal)	Runoff at Palisade (Percentage of Mar-July Normal)
1.47	-4.2	7.3	68.1	57.8
1.17	-0.5	9.0	135.7 (South Feeders 116.9)	98.4
1.91	-0.1	9.2	92.5	67.1
4.00	-1.6	7.3	102.4	82.2
1.81	-0.9	9.7	43.3	57.2
1.82	+2.1	11.3	58.6	51.1

1. 第一行

2. 第二行

3. 第三行

4. 第四行

5. 第五行

6. 第六行

7. 第七行

8. 第八行

9. 第九行

10. 第十行

PAST RECORD OF CHANGE IN WATER CONTENT OF SNOW COVER AT KEY STATIONS DURING MARCH (Cont.)

(Inches water)

Northern Feeders		Southern Feeders			
			Lamoille (7,400 ft.)	Lamoille (7,600 ft.)	Lamoille (8,100 ft.) Lamoille (9,000 ft.)
	Fox Creek (6,900 ft.)	Big Bend (6,800 ft.)	Precipitation (U. S. W.B.)		
			Owyhee-North Fork-		
			Tuscarora (5,400-		
			6,500 ft.)		
			Mar. normal		
			1.42 in.		
1941					
March 1	7.6	9.9	0.32	10.2	11.2
April 1	5.7	9.7		7.1	10.2
Gain or loss	- 1.9	- 0.2		- 3.1	- 1.0
					22.7
					24.5
					+ 1.8
AVERAGE FOR PERIOD	-0.2	- 0.01	1.31	+ 0.8	+ 1.5
					+ 3.6
1942					
March 1	9.8	10.2		12.7	13.3
April 1	8.5	10.4		13.7	14.8
Gain or loss	- 1.3	+ 0.2	0.46	+ 1.0	+ 1.5
					23.8
					28.9
					+ 5.1

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Precipitation (U. S. W. B.) Lamoille (6,100 ft.) Mar. (normal 2.83 in.)	Mean Temperature Elko (5,077 ft.) Departure (Normal 37.30°F)	Mean temp. above freezing (Normal 10.10°F)	Snow Cover April 1 (Percent of March 1 normal)	Runoff at Palisade (Percent of March-July normal)
	+1.4	11.3	58.6*	106.2**

2.11 -0.72

2.04 -0.79 -0.5

9.3

2.23 -0.60 -2.7

7.1

83.9*

*Based on survey of all courses
 **Excess precip. throughout period

CHANGE IN SNOW COVER AT LOW LEVELS DURING MARCH

(Inches water)
1941 and 1942

Northern Feeders

Southern Feeders

Fry Canyon (6,800 ft.) Gold Creek (6,600 ft.) Tremewan Ranch (5,775 ft.) Taylor Canyon (5,200 ft.) Harrison Pass (6,600 ft.) Dry Creek (6,500 ft.) Ryan Ranch (5,775 ft.)

1941
March 1
April 1
Gain or loss

9.2
8.8
-0.4

6.2
6.0
-0.2

3.2
-
-

8.3
4.6
-3.7

5.4
5.4
-2.0

6.6
3.1
-3.5

0.4
0
-0.4

1942
March 1
April 1

10.5
9.0
-1.5

8.1
7.7
-0.4

4.1
0.5
-3.6

8.5
6.4
-2.1

6.5
5.6
-0.9

7.6
3.4
-4.2

4.3
0.9
-3.4

Average gain or loss in snow cover: 1941.....1.7 in.; 1942.....-1.6 in.

Normals or averages of snow on ground April 1 and loss of snow cover by melting during March will be computed as soon as sufficient data have been accumulated.

EASTERN NEVADA
1942

APRIL 1 SNOW SURVEY DATA

Temperature Departure March, Ely (6,257 ft.) °F (Mean 30.6°F)

Mean temp. above freezing 6.4°F

Mean temperature Lehman Caves Nat. Mon. (7,200 ft.) 40.0°F
(Normals and departures not yet available)

Elevation feet		Date	Snow depth	Density	Water content	Normal water	Percentage	Precipitation
			inches	percent	inches	content Mar. 1	of Mar. 1	(U. S. W. B.)
						1 inches	normal	percentage March
Steptoe Valley								Ely (6,257 ft.)
Murray Summit	7,500	Apr. 2	7.0	36.6	2.5			1.03 in.
Baker Creek								Lehman Caves Nat. Mon.
Baker Creek No. 3								2.42 in.
Baker Creek No. 2	8,950	Apr. 1	61.5	34.6	21.3			
Baker Creek No. 1	7,950	Apr. 1	54.0	32.6	17.6			
		Apr. 1	16.8	17.2	2.9			

CHANGE IN SNOW COVER DURING MARCH
(Inches of Water)

Steptoe Valley		Baker Creek	Baker Creek	Baker Creek	Precipitation	Precipitation
			No. 3	No. 2	No. 1	(U. S. W. B.)
Murray Summit	(7,500 ft.)			(8,950 ft.)	(7,950 ft.)	Lehman Cave
						Nat. Mon.
						(7,200 ft.)
						Inches and
						percentage
						of normal
						1.12
1941						
March 1	4.2					
April 1	0.7					
Gain or loss	- 3.5					
1942						
March 1	3.7					
April 1	2.5					
Gain or loss	- 1.2					

The snow cover in Steptoe Valley though slightly less on March 1 this year than last has lasted much longer into the season.

15.6	5.3
17.6	2.9
+ 2.0	- 2.4

2.42 in.

SOUTHERN NEVADA

APRIL 1 SNOW SURVEY DATA

Temperature departure March, Las Vegas A.P. -3.1°F Approx. (Mean 53.6°F)
Mean temperature Charleston R. S. 33.8°F

Elevation	feet:	Date	Snow depth:	Density	Water content:	Normal	Percentage of:	Precipitation
:	:	:	inches	percent:	inches	water con-	Mar. 1 normal:	(U.S.W.B.) percent-
:	:	:	:	:	:	tent inches:	:	age March
:	:	:	:	:	:	March 1	:	:
Charleston Mountain								
Kyle Canyon	8,200	Apr. 27:	26.3	36.2	9.5			
Kyle Canyon	7,400	Mar. 27:	11.3	35.1	4.0			
Rainbow Canyon	7,800	Mar. 26:	30.9	35.8	11.0			Charleston R.S.
Lee Canyon	9,000	Mar. 30:	44.8	35.9	15.2			1.86 in.
Lee Canyon	8,300	Mar. 29:	33.1	34.2	11.3			

CHANGE IN SNOW COVER DURING MARCH

	Kyle Canyon	Rainbow Canyon	Charleston Mountain	Lee Canyon	Precipitation U. S. W. B.)
	(8,200 ft.)	(7,400 ft.)	(7,800 ft.)	(8,300 ft.)	Charleston R. S.
	:	:	:	:	(7,165 ft.)
1941					
March 1	18.9	11.7	22.4	16.5	5.52 in.
April 1	18.5	6.9	21.4	16.3	
Gain or loss	-0.4	-4.8	-1.0	-0.2	
1942					
March 1	8.8	5.4	10.5	7.8	1.86 in.
April 1	9.5	4.0	11.0	11.3	
Gain or loss	+0.7	-1.4	+0.5	+3.5	

The snow cover this year is less than half of last but probably is normal. Last year the precipitation was approximately 250 percent of normal.

WILDLIFE REFUGES

APRIL 1 SNOW SURVEY DATA

Sheldon National Antelope Refuge (Northern Washoe County)
Temperature Departure March Cedarville -2.3°F (Mean 37.8°F)

Elevation feet:	Date	Snow depth:	Density	Water content:	Normal water:	Percentage:	Precipitation
		inches	percent	inches	content Mar. 1	of Mar. 1	(U. S. W. B.)
					1 inches	normal	percentage March
Bald Mountain							
Peterson Canyon and							
Bald Mountain Creek	6,720	Apr. 2:	14.6	30.7	4.5		Sheldon (6,500 ft.)
Mahogany Mountain							0.25 in.
Virgin	5,680	Apr. 2:	0	0	0		

Ruby Lake National Wildlife Refuge, (Southern Elko County)

Temperature departure March, Elko -2.7°F (Mean 33.0°F)

Mean temp. above freezing 7.1°F (Normal 10.1°F)

Hagar Canyon	8,500	Apr. 7:	51.5	45.7	23.5		Arthur (6,500 ft.)
Cave Creek	7,000	Apr. 7:	36.3	45.6	16.6		52.7

GAIN OR LOSS OF SNOW COVER DURING MARCH

(Inches of water)

Sheldon Refuge

Ruby Lake Refuge

	Bald Mountain Creek (6,720 ft.)	Mahogany Mountain Virgin (5,680 ft.)	Precipitation (U.S.W.B.)	Inches and per- cent of normal	Sheldon (6,500 ft.):	Hagar Canyon (8,500 ft.)	Cave Creek (7,000 ft.)	Precipitation (U. S. W. B.)	Inches and per- cent of normal	Ruby Lake
1941										
March 1	5.9	5.3								
April 1	3.8	0								
Gain or loss	-2.1	-5.3	0.15 in.			14.8	11.9	0.80 in.		
1942										
March 1	6.2	3.0								
April 1	4.5	0								
Gain or loss	-1.7	-3.0	0.25 in.			15.6	16.2	16.6	1.18 in.	

At Sheldon Refuge snow condition the present year are much the same as last except that Virgin watershed appears to be barer. At Ruby Lake Refuge the snow cover is 50 percent better than last.

HUMBOLDT RIVER AT PALISADE

Normal Discharges in Acre Feet for Water Year

Months	24 Year Normals	33 Year Normals	37 Year Normals
October	4450	3100	3500
November	6020	4030	4600
December	6780	4580	5400
January	8310	5510	6600
February	15810	10530	12200
March	40940	28710	32600
April	56580	43560	47200
May	63540	52690	54500
June	69180	59330	60400
July	25580	17340	20300
August	4720	4020	3600
September	2660	1840	2100

The 24 year normals are averages for the years 1903/04 through 1926/27 including estimated discharges for 5 years 1906/07 to 1910/11, four of these being based on measured discharges at Golconda and one year 1909/10 being based largely on precipitation records.

The 37 year normals are for the years 1903/04 through 1939/40 using the same estimates as described for the 24 year normals.

Groups			
Nov.-Feb.	36920	24650	28800
March-July	255620	201630	215000
Annual	304370	235240	253000

The 33 year normals, prepared by A. B. Purton, are for the years 1903/04 - 1905/06 and 1911/12 through 1940/41, thus omitting the five years which had been estimated in obtaining the 24 year and the 37 year normals and including the year 1941 which has not yet been published in the Water Supply Papers.

The above 37 year normals will be used in connection with the Humboldt forecasts for 1943 and following years.

H. P. Boardman
May 23, 1942

Station	Month	Mean	Temperature, °F	Debar-	Maxi-	Mini-	Total	Debar-	hours	Snowfall
			ture	mum	mum	:		ture		unmelted,
										inches
Elko	Jan.	17.2	-5.5	50.0	+28.0	0.43	+0.91	0.36		15.2
	Feb.	24.4	-3.9	56.0	-14.0	0.84	+0.17	0.26		9.0
	Mar.	43.8	+7.4	78.0	22.0	0.60	-1.14	0.06		T
Totals								1.87 (41.5% normal)		24.2
Winnemucca	Jan.	20.0	-8.8	47.0	-15.0	0.76	-0.28	0.60		9.2
	Feb.	27.3	-6.0	55.0	-15.0	0.89	-0.04	0.44		9.4
	Mar.	48.1	+8.5	72.0	28.0	0.24	-0.71	0.08		0.3
Totals								1.89 (47.5 % normal)		18.9 = (2.1 of water)

Comparative normals of precipitation with elevations (December to March): Winnemucca (4,344 feet), 3.98 inches; Elko (5,079 feet), 5.01 inches; Lamoille (6,100 feet), 7.75 inches; Lamoille Canyon (7,400-7,600 feet), 12.76 inches, (9,000 feet), 29.48 inches, the measurements in Lamoille Canyon representing the water-content of the snow-cover March 1.

The precipitations for period December to February, which provided the flood, were: Elko-Wells, 2.92 inches = 82 percent; Winnemucca, 4.09 inches = 135 percent of normal for the period.

Daily Temperature at Winnemucca
February 20 to March 15, 1910

Date	: Maxi-	: Mini-	:	Remarks
	: mum	: mum	:	
1910	°F	°F		
Feb. 21	39	28		
22	40	25		
23	46	31		
24	49	33		
25	47	28		Reported river rose at Winnemucca two feet during day; washout on railroads
26	39	27		
27	47	32		
28	55	44		At Battle Mountain; "Sudden thaw accompanied chinook wind"
Mar. 1	60	39		Wave of high water at Palisade Canyon
2	67	32		
3	66	32		
4	65	32		
5	62	36		
6	65	32		
7	65	31		Crest of flood at Golconda
8	61	31		Maximum at Winnemucca
9	55	32		
10	60	31		
11	64	33		
12	65	35		Crest at Lovelock
13	72	36		
14	67	40		
15	63	35		

PART 1. CENTRAL SIERRA QUADRANGLE

Part I, embracing the eastern slope of the Central Sierra Quadrangle, is issued separately by the Forecast Committee of the Nevada Cooperative Snow Surveys and can be obtained upon request to the Chairman, Prof. H. P. Boardman, 735 West Street Reno, Nevada.

Nevada Agricultural Experiment Station
Reno, May 20, 1942

J. E. Church

H. P. Boardman
Forecasters

Seasonal Snow Survey and Forecast of Stream Flow

April, 1942

Nevada Co-operative Snow Surveys

PART I—CENTRAL SIERRA QUADRANGLE

Including the Truckee, Tahoe, Carson and East and West Walker Basins of the Eastern Slope

CO-OPERATION

The organizations co-operating this year in the surveys of this region are: The Nevada Co-operative Snow Surveys, including the State of Nevada, through the State Engineer's office, the Truckee-Carson Irrigation District, the Washoe County Water Conservation District and the Sierra Pacific Power Co.; the California Co-operative Snow Surveys headed by the Division of Water Resources of the Department of Public Works at Sacramento and including the Pacific Gas & Electric Co. and the Nevada Irrigation District, whose employees make the surveys of several of the courses used in this forecast; the U.S. Forest Service; and the Division of Irrigation of the U.S. Soil Conservation Service. This is the organization which is developing and co-ordinating the snow surveys throughout the western states. All of the above organizations contribute financially to the work.

The U.S. Weather Bureau and the Agricultural Experiment Station at the University of Nevada are also co-operating in various ways.

PART II. Humboldt Basin and Miscellaneous is prepared under the direction of Dr. J. E. Church of the Agricultural Experiment Station, University of Nevada.

REVIEW OF LAST YEAR

The following table shows that the actual results checked very well with the probable forecasts except in Rise of Tahoe and Runoff of the East Walker which surpassed the forecasts by relatively large amounts. The spring precipitation at Tahoe City was about normal but at several higher altitude stations the spring precipitation was considerably above normal and the May 1st snow survey at Blue Lakes showed 6.5" greater water content than did the April 1st survey. Usually there is a drop of 3" to 8" in Water Content at this location during the month of April.

1941 RESULTS

BASIN OR STREAM	Normals	1941 Forecast		Actual Results	
		% of Normal	Amount	Amount	% of Normal
	Feet		Feet	Feet	
*Rise of Tahoe April 1 to High Water.....	1.68	75.0	1.26	1.56	92.9
*Tahoe—Maximum Elevation.....		June 25	6228.30	6228.60	July 15
	Acre Ft.		Acre Ft.	Acre Ft.	
Truckee River, Exclusive of Tahoe.....	325,700	79.8	260,000	279,200	85.7
Carson River at Ft. Churchill.....	230,000	76.1	175,000	174,866	76.03
West Walker Near Chris Flat.....	191,200	97.8	187,000	190,230	99.5
East Walker Below Bridgeport Dam.....	73,000	91.8	67,000	90,460	123.9

*Assuming gates kept closed.

Several other high level snow courses surveyed by the California Co-operative Snow Surveys showed an increase in Water Content during April, 1941. There are too few U.S. Weather Bureau precipitation stations at high altitudes to give much assistance in explaining such discrepancies, but probably excessive spring precipitation in high altitudes on the Tahoe and East Walker watersheds is the explanation for the high results in those basins.

OUTLOOK FOR 1942

The snow survey indication February 1 and March 1 was in general above the normal expectancy for those dates as can be seen by a comparison of the Winter Progress table with the Winter Precipitation table on page 4 but deficient March precipitation changed the situation somewhat. October-November precipitation was a little below normal at most of the mountain weather bureau stations but December was very high in rain until after the middle of the month and high in snow during the last third. These early December rains must have primed the soil thoroughly and that should help increase the portion of the snow melt to run off on the surface.

TRUCKEE RIVER

The higher level snow courses of the Little Truckee basin have a little less water content than last year while the lower levels and the eastern outposts show up considerably better than last year.

The estimated probable natural flow at Farad gaging station exclusive of Tahoe for the April-July period is 285,000 acre feet. This is a little greater than the actual result last year. The normal distribution throughout the four months based on averages for the 41 years 1901-1941 inclusive would be:

April	32%	91,000 Acre Ft.
May	38%	108,000 Acre Ft.
June	23%	65,000 Acre Ft.
July	7%	21,000 Acre Ft.
Total.....	100%	285,000 Acre Ft.

However, temperature and distribution of precipitation during the runoff period greatly affect the relative discharge in different months.

The actual discharge at Farad will depend much on the method of control used at Boca Dam on the Little Truckee as well as at Tahoe.

Boca Reservoir contained 25,600 Acre feet on April 1st.

TAHOE

Most of the West side high level snow courses are higher than last year and all of the lower level and eastern outpost courses are considerably higher in water content than last year.

The probable rise of Tahoe April 1st to High Water is estimated at 1.60 feet assuming gates closed.

However, the lake was so high in February (above 6228.0) that the gates were opened and enough water has been released to keep the lake below 6228.0 during March. The elevation on April 1st was 6227.85 and enough water will be released so that the maximum elevation reached will be 6229.1 which is the maximum limit set by the Truckee River agreement.

CARSON RIVER

Carson Pass and Blue Lakes snow surveys showed some less water content than last year and the probable April-July discharge at Ft. Churchill is estimated at 152,000 Acre feet.

Lahontan reservoir contained about 228,500 Acre feet on April 1st.

WALKER BASIN

The West Walker will probably discharge about 172,000 Acre feet at the gaging station above Chris Flat during the April-July period.

Topaz reservoir contained 54,460 Acre feet on April 1st.

The East Walker will probably discharge about 61,000 Acre feet at Bridgeport Dam during the April-August period. This is considerably less than the actual results last year.

Bridgeport reservoir contained 43,800 Acre feet on April 1st.

1942 PROGRESS SNOW SURVEYS DURING THE WINTER

Basin	Snow Course	Altitude	1942 Date Survey	Depth Snow Inches	Density % Water	Water Content Inches	Apr. 1 Normal W. C. Inches	% Apr. 1 Normal 1942	Year 1941	
									% Apr. 1 Normal	Date
South Yuba	Furnace Flat	6600	2/10 3/3	124.1 111.7	36.3 39.8	45.0 44.5	(59.0)	76.3 75.4	70.5 90.2	1/30 3/5
	Fordyce Lake	6500	2/9 3/3	111.3 98.2	33.1 40.5	36.8 39.8	(51.0)	72.2 78.0	68.2 85.1	1/29 3/6
	Soda Springs	6750	1/30 2/5 2/27	74.8 102.1 99.5	33.2 30.2 39.0	24.8 30.8 38.8	(42.0)	59.0 73.3 92.4	80.5 103.3	1/31 3/3
	Summit	6900	1/30 2/27	82.1 105.8	32.0 38.4	26.3 40.6	47.8	55.0 84.9	77.2 93.1	1/31 3/3
Truckee	Independence Lake	8200	2/1 3/1	82.7 100.8	29.7 37.4	24.6 37.7	(47.0)	52.3 80.2	70.9 98.5	2/1 3/6
	Independence Camp	7000	2/2 3/1	53.7 64.2	28.5 38.5	15.3 24.7	(26.5)	57.7 93.2	67.5 86.0	1/31 3/5
	Independence Creek	6500	2/2 3/2	32.6 45.0	28.5 33.1	9.3 14.9	(18.0)	51.7 82.8	66.7 75.6	1/31 3/7
	Sage Hen Creek	6500	1/31 2/28	40.0 58.9	30.3 35.0	12.1 20.6	(22.0)	55.0 93.6	67.7 82.3	2/2 3/5
	Boca	5900	1/31 2/28	14.7 26.5	34.0 33.6	5.0 8.9	(9.0)	55.6 98.9	56.7 54.4	2/3 3/2
	Truckee No. 2	6400	1/31 2/28	37.1 51.0	31.8 36.3	11.8 18.5	(20.0)	59.0 92.5	65.5 72.5	2/3 3/2
Tahoe	Tahoe City	6250	1/31 2/23	26.9 40.5	34.2 33.6	9.2 13.6	15.9	57.9 85.5	63.5 76.1	2/2 3/6
	Ward Creek	7000	2/1 3/1	85.2 110.5	37.6 41.4	32.0 45.8	51.2	62.5 89.5	71.7 94.5	2/1 3/8
	Marlette Lake	8000	3/3	77.9	37.9	29.5	27.8	106.1	88.5	3/1
	Glenbrook	6700	1/31 3/1	28.7 47.7	24.4 15.9	7.0 7.6	(14.0)	50.0 54.3	55.0 57.9	2/2 3/2
	Daggett's Pass	7350	1/31 3/1	43.2 50.1	30.6 32.9	13.2 16.5	16.3	81.0 101.2	56.4 73.0	2/2 3/2
	Freel Bench	7300	2/1 2/28	37.9 50.5	31.9 33.7	12.1 17.0	(15.0)	80.7 113.3	62.0 67.3	2/1 3/1
	Upper Truckee	6400	2/1 2/28	29.7 42.8	31.0 31.8	9.2 13.6	(11.0)	83.6 123.6	72.7 81.8	2/1 3/1
	Richardson's	6500	1/31 2/28	30.1 36.4	29.9 32.1	9.0 11.7	(13.0)	69.2 90.0	75.4 65.4	2/1 3/1
	Echo Summit	7500	1/28 2/26	106.5 112.9	27.1 37.8	28.9 42.7	(40.0)	72.3 106.8		
Carson	Carson Pass	8600	1/29 2/26	98.3 95.7	29.0 39.0	28.5 37.4	(48.0)	59.4 77.9	57.3 73.1	1/29 2/26
	Blue Lakes	8000	1/31 2/28	100.2 106.2	29.2 37.9	29.3 40.3	48.1 48.1	60.9 83.8	68.8 96.5	1/31 3/5
Mono	Tioga Pass	9900	2/24	82.6	37.5	31.0	(31.0)	100.0	103.5	2/26

APRIL 1, 1942, SNOW SURVEY DATA

SNOW SURVEY STATIONS	Eleva- tion Feet	Date of 1942 Snow Survey	Depth of Snow Inches	Density of Snow % Water	Water Content Inches	April 1 Normal Water Content Inches	1942 Sea- sonal % of Normal	Last Year % of Normal
TRUCKEE BASIN								
Crest and South Yuba								
Furnace Flat.....	6600	March 30	104.4	46.1	48.1	(59)	81.5	84.4
Fordyce Lake.....	6500	March 31	84.9	48.1	40.8	(51)	80.0	80.2
Soda Springs.....	6750	March 27	84.5	45.1	38.1	(42)	90.7	98.3
Summit.....	6900	March 26	90.0	46.3	41.7	47.8	87.2	88.3
Ward Creek.....	7000	March 29	104.6	46.7	48.8	52.7	92.6	88.0
Little Truckee								
Webber Peak.....	8000	March 28	118.2	45.7	54.0	56.9	94.9	96.5
Webber Lake.....	7000	March 28	71.9	45.2	32.5	38.1	85.3	107.3
Independence Lake.....	8200	March 29	99.4	42.7	42.4	(47)	90.2	95.1
Independence Camp.....	7000	March 28	55.5	42.9	23.8	(26.5)	89.8	80.0
Independence Creek.....	6500	March 30	37.4	39.6	14.8	(18)	82.2	56.7
Sage Hen Creek.....	6500	March 28	50.5	40.6	20.5	(22)	93.2	74.5
Eastern Outposts								
Granite Peak.....	8200	March 28	59.5	36.1	21.5	24.7	87.0	73.3
Big Meadow.....	8800	March 31	53.3	44.7	23.8	28.1	84.7	80.4
Mt. Rose.....	9000 to 10,000	March 29	85.0	44.6	37.9	(45)	84.2	70.0
Lower Levels								
Boca.....	5900	March 28	15.8	40.5	6.4	(9)	71.1	0
Truckee No. 2.....	6400	March 28	44.4	40.3	17.9	(20)	89.5	62.5
Tahoe City.....	6250	April 1	28.2	44.0	12.4	15.9	78.0	38.4
TAHOE BASIN								
Crest Main Sierra								
Ward Creek.....	7000	March 29	104.6	46.7	48.8	51.2	95.3	90.6
Rubicon Peak No. 1.....	8100	March 28	119.5	40.2	48.0	48.9	98.2	85.5
Rubicon Peak No. 2.....	7500	March 28	88.6	41.6	36.9	(36)†	102.5	90.3
Lake Lucile.....	8400	March 29	134.9	44.0	59.4	61.2	97.1	103.8
Echo Summit.....	7500	March 26	98.7	44.6	44.0	(40)	110.0	93.0
Eastern Outposts	9000 to							
Mt. Rose.....	10,000	March 29	85.0	44.6	37.9	(45)	84.2	70.0
Marlette Lake.....	8000	April 1	70.1	43.1	30.2	27.8	108.6	96.0
Hagan's Meadows.....	8000	March 31	52.9	40.5	21.4	21.2	100.9	80.2
Lower Levels								
Tahoe City.....	6250	April 1	28.2	44.0	12.4	15.9	78.0	38.4
Rubicon Peak No. 3.....	6700	March 28	67.1	38.2	25.6	(30)†	85.3	72.0
Richardson's.....	6500	March 30	34.5	34.2	11.8	(13)†	90.8	59.2
Upper Truckee.....	6400	March 31	23.2	42.7	9.9	(11)	90.0	38.2
Freel Bench.....	7300	March 31	37.7	39.8	15.0	(15)	100.0	46.7
Daggett's Pass.....	7350	March 28	43.6	37.6	16.4	16.3	100.6	60.1
Glenbrook No.1.....	6700	March 28	41.6	28.1	11.7	(14)	83.6	59.3
*Glenbrook No. 2.....	6900	March 30	47.7	36.3	17.3
WASHOE VALLEY								
Marlette Lake.....	8000	April 1	70.1	43.1	30.2	27.8	108.6	96.0
*Little Valley.....	6300	March 29	28.4	41.2	11.7
CARSON BASIN								
Crest								
Carson Pass.....	8600	March 27	89.4	43.8	39.2	(48)	81.7	86.7
Blue Lakes.....	8000	March 31	97.5	41.0	40.0	48.1	83.2	94.6
*Poison Flat.....	7900	April 2	38.0	40.8	15.5
WALKER BASIN								
West Walker								
Sonora Pass.....	8800	March 29	63.3	40.6	25.7	(31)	82.9	95.8
Leavitt Meadow.....	7200	March 30	30.5	43.6	13.3	(16)	83.1	92.5
Willow Flat.....	8250	April 1	39.4	36.8	14.5	(17.5)	82.8	96.0
East Walker								
Center Mountain.....	9400	April 7	119.5	37.2	44.5	45.7	97.4	102.4
Buckeye Forks.....	8500	April 5	62.6	36.6	22.9	26.0	88.1	99.6
Buckeye Roughs.....	7900	April 5	59.9	39.4	23.6	25.9	91.1	94.6
Dunderberg Peak.....	8400	April 9	64.0	42.7	27.3	(45)	60.7	58.0
MONO BASIN								
Crest								
Tioga Pass.....	9900	March 26	79.8	43.1	34.4	(31)	111.0	123.9

* New Courses

() Tentative Normals

()† Revised Tentative Normals

FORECAST CENTRAL SIERRA—EASTERN SLOPE
APRIL - JULY, 1942

BASIN OR STREAM	Normals	Seasonal Forecast			
		Probable		*Possible Minimum	
		% of Normal	Amount	% of Normal	Amount
	Feet		Feet		Feet
†Rise of Tahoe, April 1 to High Water.....	1.68	95.2	1.60	86.3	1.45
Tahoe, Maximum Elevation.....	July 15		6229.1		6229.1
	Acre Feet		Acre Feet		Acre Feet
§Truckee, Exclusive of Lake Tahoe.....	325,700	87.5	285,000	81.4	265,000
Marlette Lake.....		108			
Carson at Ft. Churchill.....	230,000	66.1	152,000	60.9	140,000
West Walker Near Chris Flat.....	191,200	90.0	172,000	82.6	158,000
‡East Walker at Bridgeport Dam.....	73,000	83.6	61,000	68.5	50,000

* These, or even lower runoffs, may result from abnormally low spring temperatures or deficient precipitation, but this year early April precipitation is ahead of normal so probably April-June precipitation will equal or exceed normal.

§ Including changes in Boca Reservoir Storage.

† Assuming outlet gates kept closed; no outflow.

‡ The forecast period for the East Walker is April-August because of late melting of snow in high altitudes and northeastern slopes of the Saw Tooth Range West of Bridgeport.

Distribution of April-July Runoff in Typical Streams—
Per Cent of Total April-July Runoff

	Truckee at Iceland Excl. of Tahoe	Carson at Clifton	West Walker at Coleville
April	32	19	11
May	38	36	29
June	23	34	37
July	7	11	23
April-July	100.0	100.0	100.0

A retardation in the earlier months of the series assures an increase in the later months and vice versa.

ESTIMATED LAKE TAHOE ELEVATIONS FOR 1942

Dates	Elevations	Remarks
April 1.....	6227.85	Actual
April 10.....	6228.01	Actual
April 20.....	6228.22	Actual
July 15.....	6229.10	Proposed

Gates are to be operated so that the maximum will not exceed 6229.10.

Table A, below, shows what Lake Tahoe is able to supply at various elevations with gates wide open. Table B, below, shows the need of drawing from the lake during the summer and fall to maintain a flow of 500 cubic feet per second at Iceland.

A. Draft Possible at Various Elevations

Elev. (Ft.)	Draft (C.F.S.)	Elev. (Ft.)	Draft (C.F.S.)
6223.0	0	6225.5	520
6223.5	24	6226.0	730
6224.0	88	6227.0	1160
6224.5	183	6228.0	1600
6225.0	325	6229.0	2060

One foot depth on Tahoe is equivalent to 123,300 acre feet.

B. Natural Flow of Truckee River at Farad, Exclusive of Tahoe (Much Affected by Rains) August-October

	Normal Acre Feet	Second Feet
August	7485	122
September	5800	98
October	6545	106

WINTER PRECIPITATION

*Typical Progress through winter for Central Sierra Region:

Dec.-March		Nov.-March	
Date	% Due	Date	% Due
Dec. 1	0	Dec. 1	11
Jan. 1	23	Jan. 1	31
Feb. 1	52	Feb. 1	58
Mar. 1	77	Mar. 1	80
Apr. 1	100	Apr. 1	100

Seasonal Progress

†Tahoe City Precipitation, Dec.-March, 1941-1942:

Date	% of Seasonal	Actual Inches	% of Normal Due
Jan. 1	40	9.96	189
Feb. 1	74	18.40	155
Mar. 1	94	23.30	132
Apr. 1	100	24.90	109

*Based on 60 years precipitation records at Colfax and 50 years at Truckee.

†U. S. Weather Bureau observations. Normal Nov.-Mar. precipitation at Tahoe City, adjusted for 60 years by comparison with Colfax for same 21 years as available at Tahoe City is 25.75 inches and 22.9 inches for Dec.-Mar.

N.B.—Use Dec.-Mar. Table except when November precipitation leaves a substantial quantity of winter snow in the mountains.

Reno, Nevada, April 20, 1942.

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